

```

/* @(#)k_sin.c 5.1 93/09/24 */
/*
 * =====
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 * =====
 */

/* __kernel_sin( x, y, iy)
 * kernel sin function on [-pi/4, pi/4], pi/4 ~ 0.7854
 * Input x is assumed to be bounded by ~pi/4 in magnitude.
 * Input y is the tail of x.
 * Input iy indicates whether y is 0. (if iy=0, y assume to be 0).
 *
 * Algorithm
 * 1. Since sin(-x) = -sin(x), we need only to consider positive x.
 * 2. if x < 2^-27 (hx<0x3e400000 0), return x with inexact if x!=0.
 * 3. sin(x) is approximated by a polynomial of degree 13 on
 *    [0,pi/4]
 *
 *          3              13
 *      sin(x) ~ x + S1*x + ... + S6*x
 *    where
 *
 * | sin(x)          2       4       6       8       10       12   | -58
 * |----- - (1+S1*x +S2*x +S3*x +S4*x +S5*x  +S6*x ) | <= 2
 * | x                                                     |
 *
 * 4. sin(x+y) = sin(x) + sin'(x')*y
 *               ~ sin(x) + (1-x*x/2)*y
 *    For better accuracy, let
 *
 *          3       2       2       2       2
 *      r = x *(S2+x *(S3+x *(S4+x *(S5+x *S6))))
 *    then
 *
 *          3       2
 *      sin(x) = x + (S1*x + (x *(r-y/2)+y))
 */

#include "math.h"
#include "math_private.h"

static const double
half = 5.000000000000000000000000e-01, /* 0x3FE00000, 0x00000000 */
S1 = -1.6666666666666666666666324348e-01, /* 0xBFBC55555, 0x55555549 */
S2 = 8.3333333333332248946124e-03, /* 0x3F811111, 0x1110F8A6 */
S3 = -1.98412698298579493134e-04, /* 0xBF2A01A0, 0x19C161D5 */
S4 = 2.75573137070700676789e-06, /* 0x3EC71DE3, 0x57B1FE7D */
S5 = -2.50507602534068634195e-08, /* 0xBE5AE5E6, 0x8A2B9CEB */
S6 = 1.58969099521155010221e-10; /* 0x3DE5D93A, 0x5ACFD57C */

double
__kernel_sin(double x, double y, int iy)
{
    double z,r,v;
    int32_t ix;
    GET_HIGH_WORD(ix,x);
    ix &= 0x7fffffff;
    if(ix<0x3e400000)
        /* high word of x */
        /* |x| < 2**-27 */

```